

## REMARKS

Claims 1-23 are pending with claims 22 and 23 added by this paper.

Claim 1-3, 5-8, 10, and 15-22 stand rejected under 35 U.S.C §103(a) as allegedly being unpatentable over WO 96/17903 (WO). Applicants respectfully traverse these rejections.

At the outset, the present invention pertains to a process for hydrodesulfurising a kerosene and/or a gas oil where the resulting kerosene and/or gas oil cut has a sulfur content of less than 30 ppm while the process is conducted under conditions to minimize hydrogen consumption. In marked contrast, WO provides a process for improving aromatic conversion and/or lowering sulfur levels, independent of any other consideration. WO discloses that the amount of hydrogen consumed by the process does not depend solely upon the nature of the feedstock but also upon the severity of the reaction conditions used. See page 24, lines 17-21.

WO fails to teach or suggest hydrogenating a cut while minimizing hydrogen consumption.

Rather, WO discloses that the actual hydrogen consumption will be a function of the operating temperature(s), operating pressure(s), and resident times for the first and second hydrotreatment zones as well as the ratio of the volume of the third liquid hydrocarbon fraction of step (e) to the volume of the feed stock. See page 24, lines 4-10. There is no discussion of minimizing hydrogen consumption and no suggestion there is any advantage in doing so when reducing the sulfur content of the kerosene and/or gas oil cut to less than 30 ppm. WO further emphasizes the desire of an increase in hydrogenation. Increasing hydrogenation is inconsistent with the objective of the present invention to desulfurize the cut to less than 30 ppm sulfur while minimizing hydrogen consumption. See, e.g., page 15, lines 13-21. Thus, the invention of WO does not obtain the same results as the presently defined invention, but rather, more or less the opposite because WO fails to teach or suggest minimizing hydrogen consumption. Thus, there is no motivation to operate the methods of WO under conditions which minimize hydrogen consumption.

Moreover, there is no teaching or suggestion within WO to motivate one of skill in the art to modify this reference to obtain desulfurization (while minimizing hydrogen consumption) over hydrogenation. Particularly, the examples of WO are not undertaken under similar hydrogen

consumption, so as to investigate the hydrogen consumptions with different catalyst distributions and/or sulfur levels. Rather, WO discloses that catalysts used for hydrodesulfurization are usually also capable of effecting some hydrogenation of aromatic compounds provided that the hydrogen sulfide level is very low. See page 13, lines 5-8. With this teaching, one of skill in the art would be lead to maximize the catalyst volume in the first step, so as to maximize hydrotreatment with conditions under high hydrogen sulfide levels, allowing for desulfurization under conditions where hydrogenation is inhibited. This suggestion would teach away from the present invention.

In addition, the action alleges that one skilled in the art could change operating conditions, such as changing the amounts of catalyst, to reduce sulfur to any desired level including those within the claim range. However, Applicants respectfully submit that changing the catalyst distribution level between two catalytic zones is not merely changing operating conditions. Choosing conditions could include changing temperature, pressure and/or spatial velocity. However, changing the catalyst loads between two beds is not a mere operating change, because such a change during processing would have drastic effects on the resulting product, and generally would require recycling and/or reprocessing to produce product within quality specifications. That disadvantage would be a minimum assuming that there were several beds that could be arranged into separate hydrotreatment zones by changing piping configurations by opening/closing valves. If there was only a single bed for each zone, then the process would have to be shutdown, catalysts added or subtracted from the reactors, and the process restarted. This is not a mere change in operating conditions, but a major endeavor requiring the shutdown and start-up of an operating unit. Applicants respectfully submit that the distribution of catalyst between the zones is not a mere change in conditions but a fundamental change in the process. Consequently, Applicants respectfully submit that this adds another layer of nonobviousness.

Also, Applicants' invention is directed to a process for hydrodesulfurizing a kerosene and/or a gas oil cut to a residual sulfur content of less than 30 ppm weight, as recited in claim 1. Claim 1 defines an element of the processes which is the residual sulfur content of the kerosene and/or a gas oil cut. The processes defined by the claims with respect to the results achieved are so far removed from methods disclosed in the prior art that they are unobvious. The remaining

defined elements of the processes are unchanged. Further, the quantity of catalyst used in the first step of the process is about 5 to 40% by weight of the total quantity of catalyst used in the process. Clearly, there is a significant and notable difference between the process as disclosed in WO and Applicants' process as observed in the amounts of sulfur content in the final gas oil product. The lowest amount of sulfur obtained in the oil of the WO process was about 60 ppm, while the amount of sulfur in the final gas oil product of the instant invention was on the order of 10-30 ppm (see Examples 4 and 5 of the instant invention). Moreover, the arrangement of catalyst which yielded the lowest amount of sulfur in the final product of the WO disclosure was a 50:50 volume ratio distribution as described above. By contrast, Applicants' invention utilizes a quantity of catalyst that is about 5 to 40% by weight in the first step of the total quantity of catalyst used in the process.

As previously argued, WO discloses a hydrodesulfurization process for a hydrocarbon feedstock comprising supplying the feedstock to distinct hydrotreatment zones. First and second hydrotreatment zones each contain a charge of a sulphide hydrotreatment catalyst. The first hydrotreatment zone causes hydrodesulfurization of the feedstock which includes aromatics and organic sulfurous impurities.

WO discloses several examples with a two-stage hydrotreatment which demonstrate the amount of residual sulfur obtained with the hydrodesulfurization process. A review of the two stage hydrotreatment examples would reveal that three major plant configurations were used as relates to the placement of the catalyst charge between the two-hydrotreatment zones. Either a 25:75, a 50:50, or a 75:25 ratio was utilized (page 39, third paragraph and FIGS 2 - 4). Careful review of the hydrotreatment conversion ratios obtained using the different volume ratios would reveal that a 50:50 volume ratio actually yielded the lower amount of residual sulfur in the oil in line 166. Compare for example the residual sulfur in the oil in Examples 6, 7, and 8. In Example 6 wherein the diesel feedstock is supplied as in Figure 2 (using a 25:75 volume ratio), the amount of residual sulfur in the oil is 99 ppm. In Example 8, using a 75:25 volume ratio as in figure 4, the amount of residual sulfur in the oil is 111 ppm. By contrast, in Example 7, using a 50:50 volume ratio wherein the feedstock is supplied as in Figure 3, the amount of residual sulfur in the oil is 75 ppm. Similarly, a comparison of residual sulfur levels obtained in Examples 15-17

would reveal that a 50:50 volume ratio yielded the lowest residual sulfur in the oil. Examples 15 and 17 utilized respectively, a 25:75 and 75:25 volume ratio which yielded residual sulfur levels of 68 ppm and 113 ppm, respectively. Example 16 which utilized a 50:50 volume ratio yielded a residual sulfur level of 62 ppm. This data suggests that the optimal distribution of catalyst between the two zones is about 50% catalyst in each of zones 1 and 2.

As explained in Applicants' response of February 19, 2003, one of ordinary skill in the art reading the WO disclosure would not have been motivated to select a distribution of catalyst quantities as recited in claim 1 of the instant invention with the goal of obtaining the lowest amount of residual sulfur in the final gas oil product. In fact, the disclosure would actually teach away from Applicants' claimed process. Examination of the data gathered in the different Examples disclosed in WO would suggest that a 50/50 distribution of catalysts between the two-hydrotreatment zones would in fact yield the optimal distribution. Applicants' invention clearly provides an unexpected advantage as seen from Examples 3-5.

Where there is no adequate teaching or suggestion or motivation in a prior art reference to modify the process to arrive at the claimed process, there can be no proper legal basis for obviousness, *In re Laskowski et al* (CAFC 1989) 871 F.3d 115, 10 PQ2d 1397. Further, the teachings of WO disclosure would actually lead away from the present invention, therefore, there is a clear legal basis for withdrawal of the rejection of the claims under §103.

With respect to the teachings of the other secondary references, U.S. Patent Nos. 3,519,557 and 3,620,968, because they do not cure the basic deficiencies of the primary reference, their combination with the other prior art would not supply the missing teachings to render the claims obvious. So as not to burden the record further, Applicants will not discuss each of the aforesaid secondary references in detail except to state that Applicants do not necessarily acquiesce to any of the statements in the office action referring to such secondary references and reserve the right to comment later regarding same, if ever necessary.

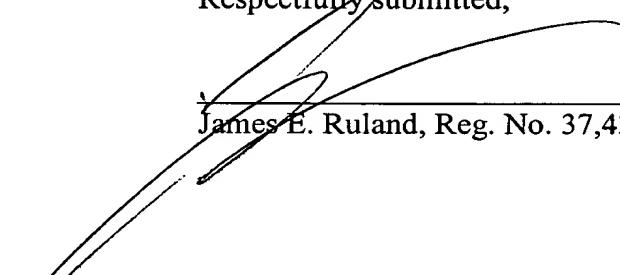
Applicants respectfully request acknowledgement of the priority documents with the next paper from the Office.

In view of the above remarks, favorable consideration is courteously requested. However, if there is any remaining issues which can be expeditiously resolved by a telephone conference,

the Examiner is courteously requested to telephone the undersigned at the number indicated below.

The Commissioner is hereby authorized to charge any fees associated with this response or credit any overpayment to Deposit Account No. 13-3402.

Respectfully submitted,

  
James E. Ruland, Reg. No. 37,432

MILLEN, WHITE, ZELANO & BRANIGAN, P. C.  
2200 Clarendon Boulevard, Suite 1400  
Arlington, Virginia 22201  
direct dial: (703) 812-5322  
fax: (703) 243-6410  
Internet address: ruland@mwzb.com

**Filed: July 29, 2003**